INFORMATION HANDOUT

For Contract No. 04-1SS364

In Healdsburg At 0.1 Mile South of Grant Avenue Undercrossing

Identified by

Project ID 0412000519

MATERIALS INFORMATION

1. Geotechnical Design Report, Dated 5/7/14

2. Materials Recommendation, Dated 9/9/14

State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Serious drought.
Help Save Water!

To: MR. MANNY CALUYA
Supervising TE-Civil
Office of Shopp

Attention: S. Lee

Date: May 7, 2014

File: 04-SON-101-PM 33.48
04 – 1SS360
Efis: 0412000519
Storm Damage

From: V. KHATAOKHOTAN / M. ZABOLZADEH
TE-CIVIL / AM&R Engineer
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

H. Nikoui

HOOSHMAND NIKOUI
Chief, Branch A
Office of Geotechnical Design – West
Geotechnical Services
Division of Engineering Services

Subject: **Geotechnical Design Report (GDR)**

This memorandum presents our geotechnical recommendations for the above referenced project. The project site is located on Route 101, PM 33.48 at Grant Avenue Undercrossing (UC) in the City of Healdsburg in Sonoma County. The recommendations contained in this report are based on the results of our previous field investigation in 2012 and recent site visits (March 28, 2014). The recommendation addresses the settlement of the existing PCC leave slab, slope erosion under the Grant Ave UC (Bridge No. 20-0067L), erosion on the outside shoulder embankment side slopes, and unstable shoulder with significant amount of roadway pavement cracks (scarp of slope failures) for a length of about 412'. See attached Exhibit A for details.

I. BACKGROUND

During early 2012, rainstorms caused the settlement of the existing PCC leave slab, erosions of the embankment slope under the bridge abutment exposing one of the abutment piles, outside embankment shoulder erosion/failure, and shoulder AC pavement cracking (scarp of slope failures). Two reports, Project Initiation Report (PIR) dated March 3, 2012 and Addendum to PIR dated April 17, 2012 (copies attached, Attachment 1) were prepared by this office to initiate a project. Please refer to these reports for complete background of this project. Since then, per our recommendation stated in the PIR, Field Maintenance has repaired the eroded outside shoulder side slope by placing Rock Slope Protection (RSP) mixed with soil and erosion control netting in 2013. In addition, Maintenance paved the shoulder in this area for a length of about 100 ft. See attached Exhibit A for details. Since then, some of the mixed soils have been washed away through the erosion netting creating exposed voids between the rocks.

II. SCOPE OF WORK

As the basis for our evaluation, we have completed the following services:

1. Field review
2. Review of published geologic maps to evaluate the prevailing geologic conditions at the site and in the site vicinity.
3. Reviewed previously prepared memorandums by this office

III. REGIONAL GEOLOGIC SETTINGS

The project is located in the Coast Range Geomorphic Province of Central California, a series of northwest-trending mountain ranges (2,000 to 4,000, occasionally 6,000 feet elevation above sea level), and intermountain valleys, bounded in the east by the Great Valley and to the west by the Pacific Ocean. The Coast Ranges are composed of thick Cenozoic sedimentary and volcanic strata overlying Mesozoic metamorphic basement rock. The northern and southern ranges are separated by a depression containing the San Francisco Bay. The Coast Ranges are subparallel to the active San Andreas Fault, which is more than 600 miles long, extending from Pt. Arena to the Gulf of California.

The site is underlain by artificial fill over Holocene stream terrace deposits. According to Dellatre (2011), the artificial fill is described as engineered or non engineered; including levees, dams, and embankments constructed to impound water. The stream channel deposits (Qhc) are described as modern to latest Holocene-aged fluvial deposits within active, natural stream channels composed of loose sand, silt, and gravel. A relevant portion of this map is included as Exhibit B, Vicinity Geologic Map.

IV. FAULT DATA AND SEISMICITY

Geologists and seismologists recognize the San Francisco Bay Area as one of the most active seismic regions in the United States. There are three major faults that trend in a northwest direction through the Bay Area, which have generated about 12 earthquakes per century large enough to cause significant structural damage. These earthquakes occur on faults that are part of the San Andreas Fault system that extends for at least 700 miles along the California Coast, and includes the San Andreas, Hayward, and Calaveras Faults. The San Andreas Fault is located approximately 19 miles southwest of the project limits. The Hayward and Calaveras Faults are located greater than 30 miles southeast of the project limits, respectively (See Exhibit C, San Francisco Bay Region Earthquake Probability Map). Additionally, the Rodgers Creek Fault is mapped 1.5 miles east of the project limits.

Seismologic and geologic experts convened by the U. S. Geological Survey concluded that there is a 62 percent probability for at least one "large" earthquake of magnitude 6.7 or greater in the Bay Area before 2032. They also maintain that there could be more than one earthquake of this magnitude and that numerous "moderate" earthquakes of about magnitude 6 are probable before 2032. The San Andreas Fault is estimated to have a 21 percent probability of producing a magnitude 6.7 or larger earthquake by the Year 2032 (WGCEP, 2003). The probability of the Hayward, Calaveras, and Greenville Faults producing a similar size earthquake during the same time period is 27 percent, 11 percent and 3 percent, respectively (See Exhibit C, San Francisco Bay Region Earthquake Probability Map).

V. LIQUEFACTION SUSCEPTIBILITY

The site may be affected by activity along any of the active faults discussed above. Earthquake induced hazards can be categorized as primary and secondary seismic effects.

Primary seismic effects such as ground rupture or surface deformation resulting from differential movement along a fault trace are not expected to occur on the site since there are no active faults mapped within the project limits.

Secondary seismic effects result from various soil responses to ground acceleration. These effects result from activity of any nearby active faults.

Liquefaction of Natural Ground – Liquefaction is a process by which soil deposits below the water table temporarily lose strength and behave as a viscous liquid rather than a solid, typically during a moderate to large earthquake. In general, very loose to medium dense, clean fine- to medium-grained sand and very soft to firm, low plasticity silts that are relatively free of clay are most susceptible to liquefaction. Earthquake-induced ground shaking can cause these loose or soft materials to densify, resulting in increased pore water pressures and an upward movement of groundwater that may result in a liquefied condition. Depending on the weight of the structure, the depth to the liquefied stratum, and the nature of the overlying soils, structures situated above such temporarily liquefied soils may sink or tilt, causing significant structural damage.

According to the Liquefaction Susceptibility Map, the liquefaction susceptibility at the site is moderate (see Exhibit D, Liquefaction Susceptibility Map).

VI. SUBSURFACE SOIL CONDITIONS

There were no subsurface investigations performed for this job. The As-built plans for the Grant Ave UC (Bridge No. 20-0067L) were obtained for review. The embankment materials are observed to be fill material, consisting of silty sand mixed with gravel.

VII. RECOMMENDATIONS

To address the issues within the limits of this project, we considered two options. First option was to remove and reconstruct the damaged areas. Second option was to mitigate the damaged areas with polyutherane grout injections. Based on our field meeting on March 28, 2014 with District Design, Hydraulics and Maintenance, staging for the first option seemed to be extremely difficult and costly due to high traffic volume. Therefore, our office recommends the second option with the following details:

PCC Leave Slab

- Using lightweight polyutherane material grout injection, stabilize the foundation of the settled PCC leave slab to the depth of about 15' below the ground surface. Then lift the slab as required (about 2") to establish proper profile of the roadway. For the limits of grouting and details, see attached Exhibit A.

Embankment Slope under the Bridge

- Due to the above-proposed polyutherane material grout injections within the limits of the PCC leave slab, we do not anticipate any future erosion of the slope under the bridge. Therefore we recommend restoring the washout areas and exposed abutment pile by filling the cavities with imported borrow and compact as directed by the Engineer.

Outside Shoulder

1. Using polyutherane material grout injection, stabilize the failing existing outside shoulder to the depth of 15' below ground surface for a length of 412 ft. See attached Exhibit A for details. The lightweight polyurethane material grout and the injection steel pipe piles will remain in the ground and will be penetrating into the failure planes to increase the shear strength of the

embankment soil, prevent surface runoffs water seepage, and bond the moving zone of the shoulder to none moving zone of the embankment (Lane # 2 of the travelled way).

2. Grind the AC pavement, for the entire 412' affected area, place pavement enhancement fabric, and place new pavement. Consult Materials for their specific recommendations and details.

3. Reconstruct the existing AC Dike to prevent any sheet flow of the runoffs during storm events.

Embankment Side Slopes

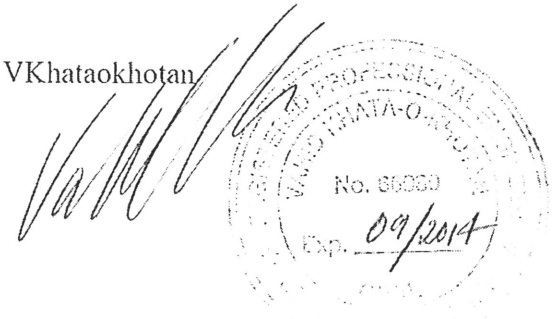
1. The existing RSP should remain in place.
2. Remove the existing erosion control netting placed by Maintenance, add imported borrow, or top soil as necessary to fill the cavities and compact as directed by the engineer. Place new erosion control. Consult with Landscape Architect for their recommendations.

IX. CONSTRUCTION CONSIDERATIONS

Since lightweight polyutherane grout is liquid and travels quickly through any void space, drainage inlet pipes and utilities will be at risk. However, based on our experience with qualified contractors, the issue could be overcome with close inspection and controlled rate of grout injection. We recommend to show all existing utilities, culverts, etc. on the plans within the limits of the project to be monitored closely during grout injection.

If you have any questions or need additional information, please call us at (510) 622-1729/286-4831 or Hooshmand Nikoui, Branch Chief at (510) 286-4811.

c: TPokrywka, HNikoui, MZabolzadeh, VKhataokhotan



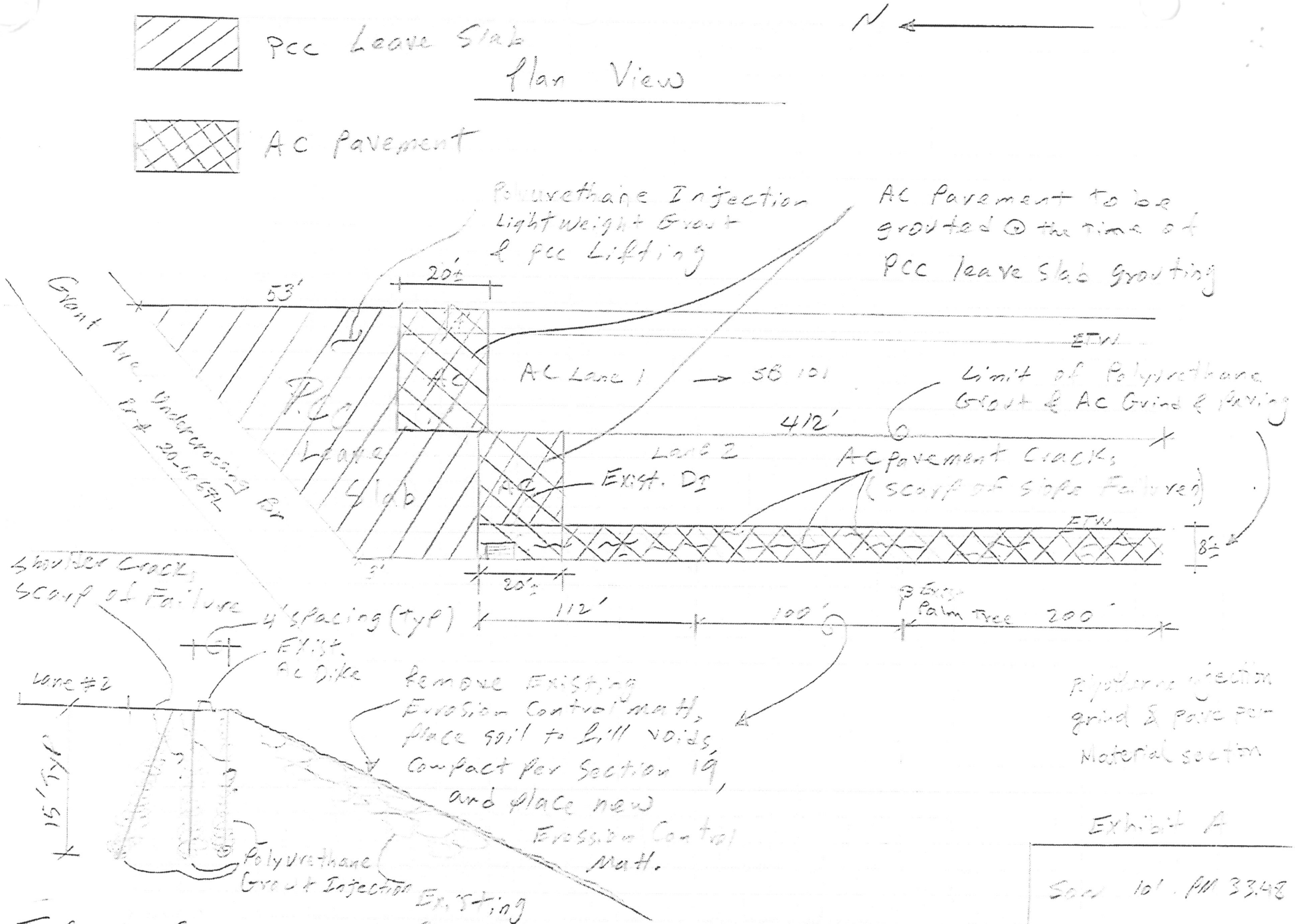
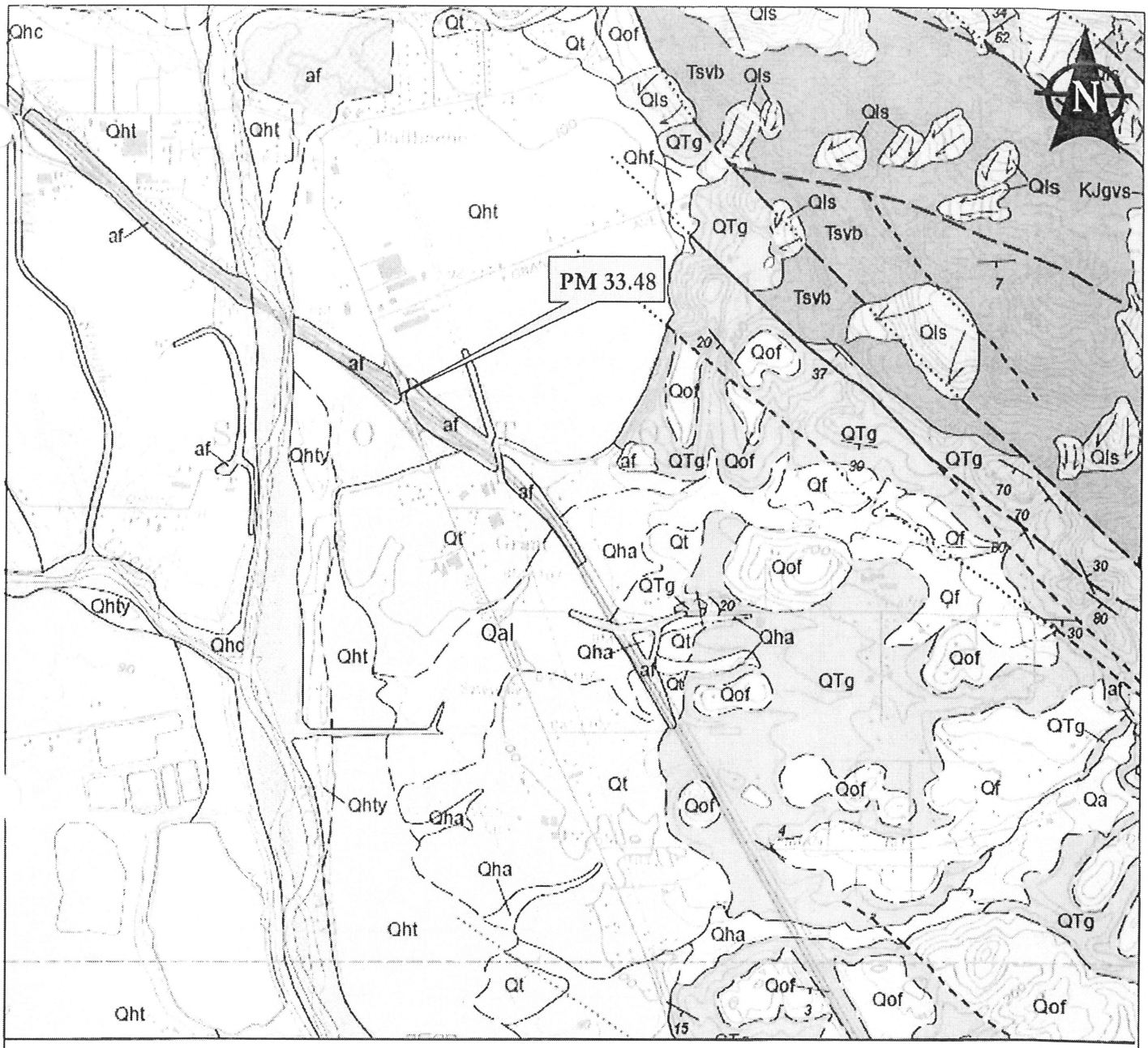


Exhibit A

Scale 10' per 33.48

04-155360

May 1, 2014

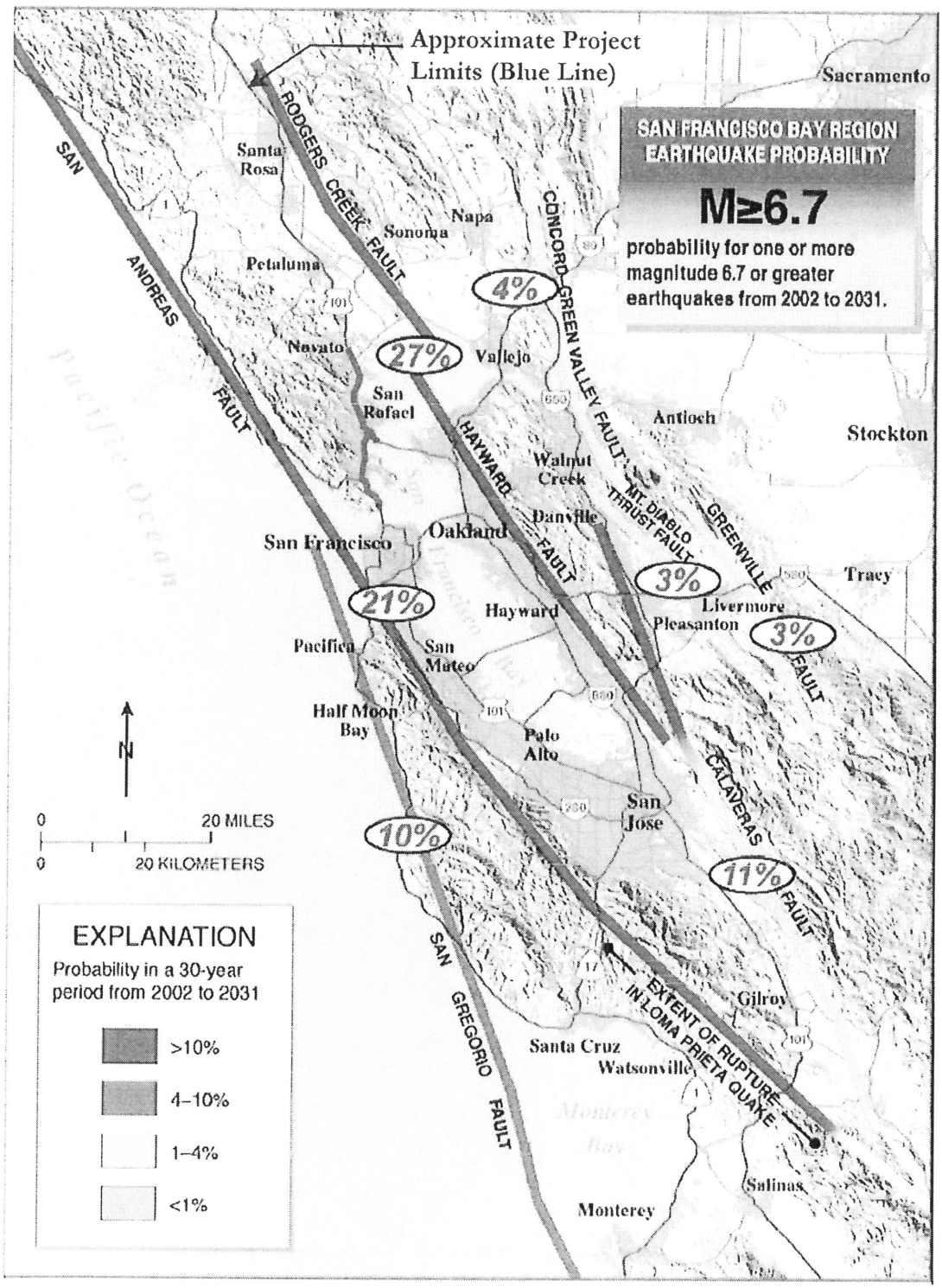


LEGEND

af	Artificial fill (historical)	Qt	Stream terrace deposits (Holocene to latest Pleistocene)
Qal	Alluvial fan and fluvial deposits (Quaternary)	Qht	Stream terrace deposits (Holocene)

Base: Preliminary Geologic Map of the Healdsburg 7.5' Quadrangle, Sonoma County, California (Delattre, 2011)
not to scale

Caltrans	STORM DAMAGE HIGHWAY 101 POST MILE 33.48 SONOMA COUNTY, CALIFORNIA	GEOLOGIC MAP
	MAY 2014	EXHIBIT B



Caltrans	STORM DAMAGE HIGHWAY 101 POST MILE 33.48 SONOMA COUNTY, CALIFORNIA	SF BAY REGION EARTHQUAKE PROBABILITY
	MAY 2014	EXHIBIT C

Liquefaction Susceptibility Map

Susceptibility Level

- Very High
- High
- Moderate
- Low
- Very Low
- Major Roads
- Local Roads

Scale: 1 inch = 0.51 miles

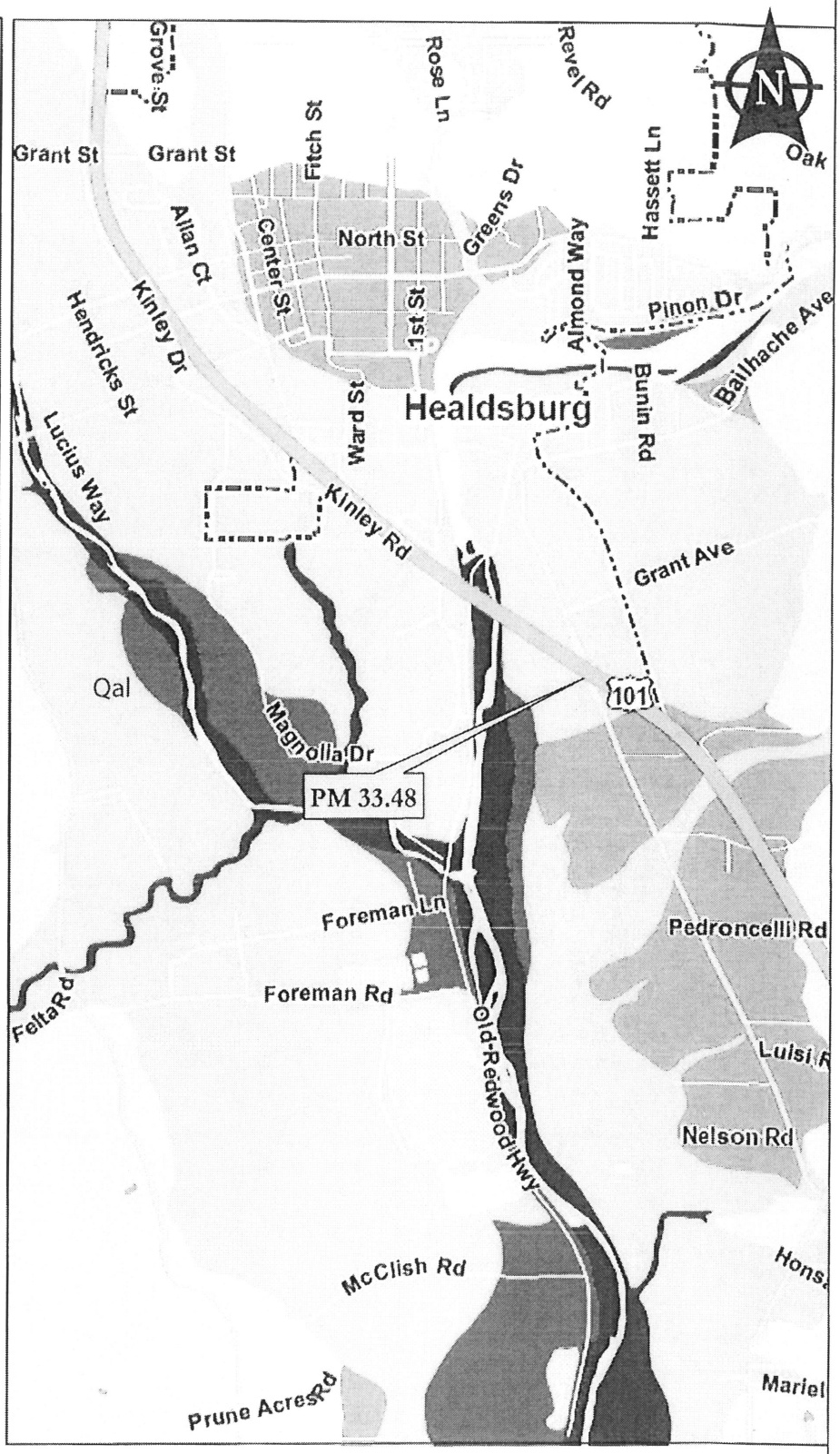
This map is intended for planning use only and is not intended to be site-specific. Rather, it depicts the general hazard level of a neighborhood and the relative hazard levels from community to community. Hazard levels are less likely to be accurate if your neighborhood is on or near the border between two zones. This information is not a substitute for a site-specific investigation by a licensed professional.

This map is available at http://quake.abag.ca.gov

Sources:
This map is based on work by William Lettis & Associates, Inc. and USGS.
USGS Open-File Report 00-444, Knudsen & others, 2000 and
USGS Open-File Report 2006-1037, Witter & others, 2006

For more information visit:
http://pubs.usgs.gov/of/2000/of00-444/
http://pubs.usgs.gov/of/2006/1037/

ABAG Geographic Information System



Caltrans	STORM DAMAGE HIGHWAY 101 POST MILE 33.48 SONOMA COUNTY, CALIFORNIA	LIQUEFACTION SUSCEPTIBILITY MAP
	MAY 2014	EXHIBIT D

State of California
DEPARTMENT OF TRANSPORTATION

California State Transportation Agency

Memorandum

Serious Drought!
Help Save Water!

To: MR. STEWART LEE
District Brach Chief
Office of Design SHOPP

Date: September 9, 2014

File: 04-SON-101
PM 33.5
EA 1SS360 (0412000519)
Embankment Slip-out

From: BRIAN W. BARBER P.E.
Materials Design Engineer
Office Of Engineering Services, - Materials B

Subject: Pavement Recommendations

This memorandum is in response to your August 11, 2014 memorandum requesting our office provide pavement recommendations for a PA/ED phase project (EA 1SS360) for an embankment slip-out repair on southbound Route 101 at PM 33.5 located near the City of Healdsburg in Sonoma County.

We understand the scope of proposed work includes, but is not limited to, grading an existing embankment where the slip-out occurred, grading existing eroded embankment under the Grant Avenue Undercrossing (Bridge No. 20-0067L); using lightweight polyurethane grout injection to stabilize the foundation of the settled PCC Southbound 101 leave slab; lifting the slab as required; using the polyurethane grout injection to stabilize the outside AC shoulder; and then grinding and repaving the shoulder. With regard to the Route 101 pavement repairs your office has requested recommendations for the mainline, shoulders and leave slabs.

Information provided for our review on this project included:

- Title Plan, undated.
- Traffic Index information for this project provided by Caltrans 04 Planning/Advance Planning, Modeling &Traffic Forecasting in their E-mail dated 7/25/14.
- "Geotechnical Design Report (GDR)" (for project: SON-101 PM 33.48 EA 1SS360), by Office Of Geotechnical Design-West, dated May 7, 2014.
- Damage Assessment Form and attachments for SON-101 PM 33.48 EA 1SS360.

Pavement Recommendations

Upon successful completion of the Caltrans geotechnical proposed lightweight polyutherane material grout injection, (Ref. May 7, 2014 GDR) of the damaged pavement areas the following are our pavement repair recommendations:

Mr. Stewart Lee
Atten: Jianghong Li
September 9, 2014

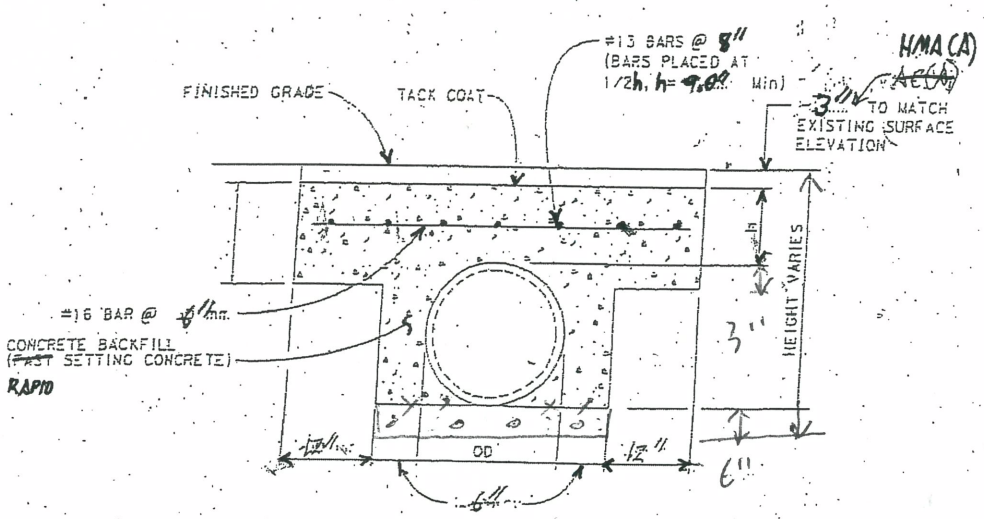
Cold plane 0.25 feet of the existing southbound AC shoulder and southbound mainline #2 lane AC pavement for a total length of 412 feet (as measured from the southern edge of the #2 lane bridge concrete leave slab), including the full width of the shoulder and the mainline #2 lane. Also cold plane 0.25 feet of the existing southbound mainline #1 lane AC pavement for a total length of 50 feet (as measured from the southern edge of the #1 lane bridge concrete leave slab). Replace with 0.10 feet (variable) "Leveling Course" with ½-inch graded Hot Mix Asphalt-Type A (HMA-A); then place Paving Fabric (Caltrans Standard Specifications-Section 88-1.02J); followed by 0.15 feet of 1/2-inch graded HMA-A. Adjust the 0.10 (variable thickness) HMA-A leveling course as needed to bring shoulder and mainline back to original design cross-slope/grade level, and to conform with the bridge leave slab final elevation (Note: A Profilograph survey may be needed to establish final pavement/leave slab grade elevations and cross slopes). Place 'Tack Coat" as required on all ground pavement horizontal and vertical surfaces, including between HMA lifts during paving operations.

Note: Coordinate with Caltrans Hydraulics and Geotechnical Officee recommendations pertaining to this project for installation/construction of drainage design facilities and grouting <u>prior</u> to implementing the above paving recommendations.

If you have any comments or questions, please contact Brian Barber at (510) 622-5490.

c: Daily File, Route File, Chalotte Cashin (Hydraulics Office), Vahid Khataokhotan (Geotechnical Office)

BBarber/dg/SON-101, EA 1SS360 (0412000519) PA/ED Pavement Recom.



NOTES:

1. IF COVER OVER CULVERT PIPE IS GREATER THAN 1.0 FEET ~~0.31 METER~~ THEN NO STEEL REINFORCEMENT IS NEEDED.
2. CULVERT PIPE SHOULD BE SECURED SO IT DOES NOT FLOAT DURING CONCRETE POUR.
3. IF HIGH CHLORIDES OR OTHER ACCELERATORS TO BE USED WITH THE RAPID ~~FAST~~ SETTING CONCRETE WOULD BE CONSIDERED DETRIMENTAL TO STEEL REINFORCEMENT (IF USED ON THIS PROJECT) THEN THE STEEL WILL NEED TO BE PROTECTED WITH AN APPROVED EPOXY COATING OR EQUIVALENT.

TRENCH BACKFILL DETAIL - 1